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मानक

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Jawaharlal Nehru

“Step Out From the Old to the New”

IS 11357 (1985): Composite containers for dry products [CHD
15: Paper and its products]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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IS : 11357 - 1985

Indian Standard
SPECIFICATION FOR
COMPOSITE CONTAINER FOR
DRY PRODUCTS

UDC 621.798.144 : 661.185/187-492



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INDIAN STANDARDS INSTITUTION
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Gr 3

March 1986

AMENDMENT NO. 1 MARCH 1998
TO
IS 11357 : 1985 SPECIFICATION FOR
COMPOSITE CONTAINER FOR DRY PRODUCTS

(Page 3, clause 0.3) — Insert the following after 0.3 and renumber the subsequent clause:

‘0.4 A scheme for labelling environment friendly products to be known as ECO Mark has been introduced at the instance of the Ministry of Environment and Forests (MEF). The ECO Mark shall be administered by the Bureau of Indian Standards (BIS) under the *BIS Act*, 1986 as per the Resolution No. 71 dated 20 February 1991, published in the Gazette of the Government of India. For a product to be eligible for ECO Mark it shall also carry Standard Mark of BIS for quality, in addition to the compliance with the optional environment friendly (EF) requirements. For this purpose, the Standard Mark of BIS would be a single mark being a combination of the ISI Mark and the ECO logo. Requirements to be satisfied for a product to qualify for the BIS Standard Mark for ECO friendliness, will be included in the relevant published Indian Standard through an amendment. These requirements will be optional; manufacturing units will be free to opt for the ISI Mark alone also.

This amendment is based on the Gazette Notification No. 364 dated 7 September 1995 for packaging material/package (Part I Paper Board and Plastics Excluding laminates) as environment friendly products, published in the Gazette of India. This Amendment is, therefore, being issued to this standard to include EF requirements for composite container for dry products.’

(Page 6, clause 4.5) — Insert the following new clauses after 4.5:

‘4.6 Additional Requirements for ECO Mark

4.6.1 General Requirements

4.6.1.1 The product shall conform to the requirements for quality and performance prescribed under clauses 4.1 to 4.5.

4.6.1.2 The manufacturer shall produce to BIS, the environmental consent clearance from the concerned State Pollution Control Board as per the provisions of *Water*

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(*Prevention and Control of Pollution*) Act, 1974 and Air (*Prevention and Control of Pollution*) Act, 1981 along with the authorization, if required under the *Environment (Protection)* Act, 1986 and the Rules made thereunder, while applying for ECO Mark. Additionally the manufacturers shall also comply with the provisions under *Prevention of Food Adulteration Act*, 1954 and the Rules made thereunder wherever necessary.

4.6.2 Specific Requirements

4.6.2.1 The material shall be of the following two types depending on the raw material used in the manufacture:

- a) *Type A* — Manufactured from pulp containing not less than 60 percent by mass of pulp made from materials other than bamboo, hardwood, softwood and reed.
- b) *Type B* — Manufactured from pulp made from 100 percent waste paper or agricultural/industrial waste.

4.6.2.2 The material if used for the packaging of food materials, shall be manufactured from virgin pulp and shall be free from dioxins. Printed surfaces of the paper shall not come into contact with the food and the maximum amounts of contaminants in paper intended to come into contact with food shall not exceed the limits prescribed in Table 2 when tested according to the methods given in Annex A.

Table 2 Limits of Contaminants in Paper
(*Clause 4.6.2.2*)

Contaminant	Paper Intended to Come into Contact with Dry Food (mg/kg of paper)	Paper Intended to Come into Contact with Wet Food and Food with Fatty Surface (mg/kg of paper)	Paper for Filtration (mg/kg of paper)
Cadmium (Cd)	—	0.5	0.5
Chromium (Cr ⁶⁺)	—	0.1	0.1
Lead (Pb)	—	3.0	3.0
Mercury (Hg)	—	0.3	0.3
Pentachlorophenol (PCP)	0.05	0.05	0.05
Polychlorinated biphenyls (PCBs)	2.0	2.0	0.5

(Page 8, clause 6.2.1) — Insert the following new clauses after 6.2.1:

‘6.3 Additional Requirements for ECO Mark

6.3.1 For ECO Mark, composite container for dry products shall be packed in such packages which shall be recyclable/reusable or biodegradable.

6.3.2 The composite container for dry products may display in brief the criteria based on which the product has been labelled as environment friendly.

6.3.3 The composite container for dry products may be sold along with instruction for proper use and mode of safe disposal so as to maximise its performance and minimise wastage.

6.3.4 It shall be suitably marked on composite container for dry products that ECO Mark label is applicable only to the packaging material/package if content is not separately covered under the ECO Mark scheme.

NOTE — It may be stated that the ECO Mark is applicable to the product or packaging material or both.’

(Page 8, clause 7) — Insert the following after 7:

ANNEX A

(Clause 4.6.2.2)

**DETERMINATION OF CHROMIUM, LEAD, MERCURY, CADMIUM,
PENTACHLOROPHENOL AND POLYCHLORINATED BIPHENYLS**

A-1 DETERMINATION OF CHROMIUM (as Cr⁶⁺)

A-1.1 Principle

The hexavalent chromium is determined colorimetrically by reaction with diphenylcarbazide in acid solution at a wavelength of 550 nm.

A-1.2 Apparatus

A-1.2.1 Spectrophotometer

Any spectrophotometer suitable for measurement at a wavelength of about 550 nm or photoelectric absorptiometer fitted with filters giving maximum transmission near 550 nm.

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A-1.2.2 Shaker

Any shaker suitable for rotating/moving at 30 ± 2 rev/min.

A-1.3 Reagents

A-1.3.1 Extraction Fluid — Mix 5.7 ml of acetic acid in distilled water.

A-1.3.2 Nitric Acid — Concentrated.

A-1.3.3 Sulphuric Acid — Approximately 0.2 N.

A-1.3.4 Diphenylcarbazide Solution

Dissolve 0.25 g of diphenylcarbazide in 50 ml acetone. Store in a brown bottle. Discard when solution becomes discoloured.

A-1.3.5 Stock Chromium Solution

Dissolve 0.141 g $K_2Cr_2O_7$ in distilled water and dilute to 100 ml. One millilitre of this solution contains 500 μg of chromium (as Cr^{6+}).

A-1.3.6 Intermediate Chromium Solution

Take 10 ml of stock chromium solution and dilute to 1 000 ml with distilled water. One millilitre of this solution contains 5.00 μg of chromium (as Cr^{6+}).

A-1.3.7 Standard Chromium Solution

Take 10 ml of intermediate chromium solution and dilute to 1 000 ml with distilled water. One millilitre of this solution contains 0.05 μg of chromium (as Cr^{6+}).

A-1.3.8 Indicator Paper — Covering the pH range 0.5 to 1.5.

A-1.4 Procedure

A-1.4.1 Preparation of Calibration Curve

Into each of a series of ten 250-ml volumetric flasks, place the quantities of standard chromium solution as indicated below:

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<i>Standard Chromium Solution</i>	<i>Corresponding to Cr^{6+}</i>
ml	μg
1.0	0.05
2.0	0.10
3.0	0.15
4.0	0.20
5.0	0.25
6.0	0.30
7.0	0.35
8.0	0.40
9.0	0.45
10.0	0.50

A-1.4.1.1 Add sulphuric acid to adjust the solution pH to 1.0 ± 0.3 in each flask and dilute to 100 ml. Add 2.0 ml diphenylcarbazide solution, mix thoroughly and wait for 10 minutes.

A-1.4.1.2 Carry out the measurement on the spectrophotometer or on a photoelectric colorimeter using appropriate filter with a 1-cm cell at a wavelength of 550 nm. As references use extraction fluid. Correct the absorbance readings of standard solution by subtracting absorbance of a reagent blank carried through the above method.

A-1.4.1.3 Construct a calibration curve by plotting corrected absorbance values against chromium content in microgram per 102 ml.

A-1.4.2 Determination

A-1.4.2.1 Sample preparation

Tear the air dry sample into pieces of suitable size. Do not use cut or punched edges or other parts where metallic contamination may have occurred.

A-1.4.2.2 Preparation of test solution

Weigh to the nearest 0.01 g about 20 g of paper, leach the paper with about 200 ml of extraction fluid for 18 ± 2 h using shaker rotating/moving at 30 ± 2 rev/min. Filter the extract through glass fibre filter with 0.45 micron pore size. Add sufficient amount of aluminium sulphate and filter if any precipitate appears. Transfer the solution quantitatively to a volumetric flask of suitable capacity, dilute to the mark and mix.

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A-1.4.2.3 According to the expected chromium content, take an aliquot portion of the test solution containing 10 to 100 µg of chromium to a 100-ml volumetric flask. Adjust the pH of the solution to 1.0 ± 0.3 by adding 0.2 N sulphuric acid. Dilute to 100 ml. Add 2 ml diphenylcarbazide solution, mix thoroughly, and wait for 10 minutes.

A-1.4.2.4 Photometric measurement

Carry out the photometric measurements of the test solution according to the methods given in A-1.4.1.1.

A-1.4.3 Calculation

By means of the calibration curve (*see* A-1.4.1.3) determine the quantity of chromium present:

$$\text{Chromium (as Cr}^{6+}\text{), ppm} = \frac{m \times D}{M}$$

where

m = mass of chromium determined in the aliquot of the sample solution, µg;

D = ratio of the volume of test solution to the volume of aliquot portion taken for the colour development; and

M = mass of paper sample taken for testing, g.

A-2 DETERMINATION OF MERCURY (as Hg)

A-2.1 Principle

The flameless atomic absorption procedure is a physical method based on the absorption of radiation at 253.7 nm by mercury vapour. The mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapour passes through a cell positioned in the light path of mercury hollow cathode lamp of an atomic absorption spectrophotometer. Absorbance (peak height) is measured as a function of mercury concentration and record.

A-2.2 Apparatus

A-2.2.1 Atomic Absorption Spectrometer (AAS) and Associated Equipment

Instrument settings recommended by the manufacturer shall be followed. Instruments designed specifically for the measurement of mercury using the cold vapour technique may be substituted for the AAS.

A-2.2.2 Mercury Vapour Generation Assembly

Consists of an absorption cell, peristaltic pump, flow meter, aeration tubing and a drying tube containing magnesium perchlorate.

A-2.2.3 Mercury Hollow Cathode Lamp

A-2.2.4 Recorder/Printer/Display Meter

Any multi-range variable recorder that is compatible with the UV detection system is suitable.

A-2.3 Reagents

A-2.3.1 Sulphuric Acid — Concentrated.

A-2.3.2 Nitric Acid — Concentrated.

A-2.3.3 Stannous Chloride Solution

Dissolve 25 g of stannous chloride (SnCl_2) in water containing 50 ml of concentrated hydrochloric acid and dilute to 250 ml. If a suspension forms, stir reagent continuously during use.

A-2.3.4 Sodium Chloride — Hydroxylamine Sulphate Solution

Dissolve 12 g of sodium chloride and 12 g of hydroxylamine sulphate (NH_2OH) $_2$ H_2SO_4 in distilled water and dilute to 100 ml.

A-2.3.5 Potassium Permanganate Solution

Dissolve 5 g of potassium permanganate in distilled water and dilute to 100 ml

A-2.3.6 Potassium Persulphate Solution

Dissolve 5 g of potassium persulphate in distilled water and dilute to 100 ml

A-2.3.7 Stock Mercury Solution

Dissolve 1.354 g of mercuric chloride in about 700 ml of distilled water. Add 10 ml of concentrated nitric acid and make up to 1 000 ml. One millilitre of the solution contains 1 mg of mercury as Hg

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A- 2.3.8 Standard Mercury Solution

Prepare a series of standard mercury solutions containing 0 to 5 $\mu\text{g/l}$ by appropriate dilution of stock mercury solution (A-2.3.7) with water containing 10 ml of concentrated nitric acid per litre. Prepare standards daily

NOTE — Use mercury free distilled water for the preparation of reagents and standards

A-2.4 Procedure

A-2.4.1 Instrument Operation

Follow the procedure of the manufacturer's operating manual. Connect the mercury vapour generating assembly as shown in Fig. 1.

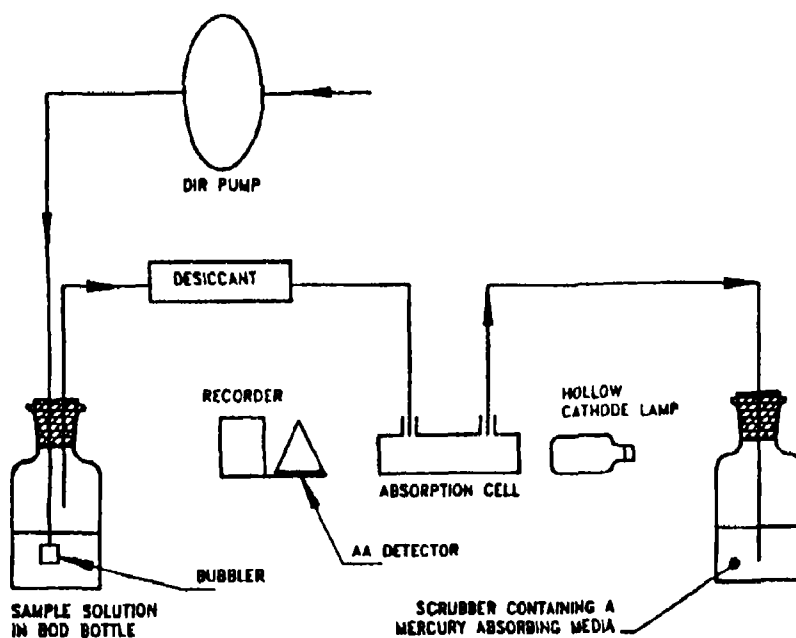


FIG. 1 SCHEMATIC ARRANGEMENT FOR MEASUREMENT OF MERCURY BY COLD VAPOUR ATOMIC ABSORPTION TECHNIQUE

A-2.4.2 Standardization

Transfer 100 ml of each of the 1.0, 2.0 and 5.0 µg/l standard mercury solution and a blank of 100 ml water to 300 ml BOD bottles. Add 5 ml of concentrated sulphuric acid and 2.5 ml of concentrated nitric acid to each bottle. Add 15 ml of potassium permanganate solution to each bottle and let stand for at least 15 minutes. Add 8 ml of potassium persulphate ($K_2S_2O_8$) solution to each bottle and heat for 2 hours in a water bath at 95°C. Cool and add 6 ml of sodium chloride-hydroxylamine sulphate solution to reduce the excess permanganate. After decolourization add 5 ml of stannous chloride solution and attach the bottle immediately to the aeration apparatus forming a closed system. As mercury is volatilised and carried into the absorption cell, absorbance will increase to a maximum within a few seconds. As soon as recorder returns approximately to the base line, remove stopper holding the aeration frit from the reaction bottle and replace with a bottle containing distilled water. Flush the system for a few seconds and run the next standard in the same manner. Construct a standard calibration curve by plotting absorbance (peak height) versus mercury concentration in µg.

A-2.4.3 Determination

A-2.4.3.1 Sample preparation

Tear the air dry sample into pieces of suitable size. Do not use cut or punched edges or other parts where metallic contamination may have occurred.

A-2.4.3.2 Preparation of test solution

Weigh to the nearest 0.01 g about 20 g of paper, leach the paper with about 200 ml of extraction fluid for 18 ± 2 h using shaker rotating/moving at 30 ± 2 rev/min. Filter the extract through glass fibre filter with 0.45 micron pore size. Transfer the solution quantitatively to a volumetric flask of suitable capacity, dilute to the mark and mix.

A-2.4.3.3 According to the expected mercury content, take an aliquot portion of the test solution containing not more than 5 µg/l of mercury to a 300 ml BOD bottle and treat as in A-2.4.2.

A-2.5 Calculation

Determine peak height of sample from recorder chart, read mercury value from standard curve and determine the mercury content of the sample using the following formula:

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$$\text{Mercury (as Hg), ppm} = \frac{C \times V}{M \times 1\,000}$$

where

C = concentration of mercury from the calibration curve;

V = volume of test solution prepared, ml; and

M = mass of paper sample taken for testing, g.

A-3 DETERMINATION OF LEAD (as Pb)

A-3.1 Principle

The lead content of the sample is determined by electrothermal atomic absorption spectrometric method.

A-3.2 Apparatus

A-3.2.1 Atomic Absorption Spectrometer — with graphite oven technique in place of conventional burner assembly.

A-3.2.2 Lead Hollow-Cathode Lamp or Multielement Hollow-Cathode Lamp — for use at 283.3 nm.

A-3.2.3 Hot Plate

A-3.3 Reagents

A-3.3.1 Nitric Acid — concentrated.

A-3.3.2 Nitric Acid — 1:1.

A-3.3.3 Dilute Nitric Acid — 1:499.

A-3.3.4 Stock Lead Solution

Dissolve 1.599 9 g of $\text{Pb}(\text{NO}_3)_2$ in a mixture of 10 ml of concentrated HNO_3 and 100 ml of water and dilute to 1 litre. One millilitre of this solution contains 1.0 mg of lead (as Pb).

A-3.3.5 Intermediate Lead Solution

A-3.3.6 Standard Lead Solution

Dilute 100 ml of intermediate lead solution to 1 litre with dilute nitric acid (1:499). One millilitre of this solution contains 0.1 mg of lead (as Pb).

A-3.4 Procedure

A-3.4.1 Sample Preparation

Tear the air dry sample into pieces of suitable size. Do not use cut or punched edges or other parts where metallic contamination may have occurred.

A-3.4.2 Preparation of Test Solution

Weigh to the nearest 0.01 g about 20 g of paper, leach the paper with about 200 ml of extraction fluid for 18 ± 2 h using shaker rotating/ moving at 30 ± 2 rev/min. Filter the extract through glass fibre filter with 0.45 micron pore size.

A-3.4.3 Transfer the extract to a 250-ml conical flask. Add 5 ml concentrate nitric acid and a few boiling chips or glass beads. Slowly evaporate on a hot plate to about 10 to 20 ml. Continue heating and adding concentrated nitric acid until digestion is complete. Wash down with water and then filter if necessary. Quantitatively transfer filtrate to a 100-ml volumetric flask, dilute to the mark and mix thoroughly.

A-3.4.4 Inject a measured portion of the digested solution into the graphite oven. Dry, char and atomize according to the preset programme. Measure the absorbance.

A-3.4.5 Prepare a reagent blank and sufficient standards containing 5.0, 7.5 and 10.0 mg/l of lead by diluting suitable volume of the standard lead solution with nitric acid (1:499) and repeat as above (A-3.4.3). Inject a suitable portion of each standard solution in order of increasing concentration. Analyse each standard solution and measure the absorbances.

A-3.4.6 Calculation

Construct a standard calibration graph by plotting the absorbance versus mg of lead concentration of each standard. Read the concentration of the sample from the graph and determine the lead content of the sample from the calibration graph using the following formula:

$$\text{Lead (as Pb), ppm} = \frac{C \times F \times 100}{M}$$

where

C = concentration of lead from the calibration curve;

F = dilution factor; and

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M = mass of paper sample taken for testing, g.

A-4 DETERMINATION OF CADMIUM (as Cd)

A-4.1 Principle

The cadmium content of the sample is determined by electrothermal atomic absorption spectrometric method.

A-4.2 Apparatus

A-4.2.1 Atomic Absorption Spectrometer — with graphite oven technique in place of conventional burner assembly.

A-4.2.2 Cadmium Hollow-Cathode Lamp or Multielement Hollow-Cathode Lamp — for use at 228.8 nm.

A-4.2.3 Hot Plate

A-4.3 Reagents

A-4.3.1 Nitric Acid — Concentrated.

A-4.3.2 Nitric Acid — 1:1.

A-4.3.3 Dilute Nitric Acid — 1:499.

A-4.3.4 Stock Cadmium Solution

Dissolve 1.0 g of pure cadmium metal in minimum quantity of concentrated nitric acid and dilute to 1 litre with distilled water. One millilitre of this solution contains 1 mg of cadmium (as Cd).

A-4.3.5 Intermediate Cadmium Solution

Add 1 ml of concentrated nitric acid to 50 ml of stock solution and dilute to 1 litre with distilled water. One millilitre of this solution contains 50 µg of cadmium (as Cd).

A-4.3.6 Standard Cadmium Solution

To 10 ml of cadmium intermediate solution add 1 ml of concentrated nitric acid and dilute to 1 litre with distilled water. One millilitre of this solution contains 0.5 µg of cadmium (as Cd).

A-4.4 Procedure

A-4.4.1 Sample Preparation

Tear the air dry sample into pieces of suitable size. Do not use cut or punched edges or other parts where metallic contamination may have occurred.

A-4.4.2 Preparation of Test Solution

Weigh to the nearest 0.01 g about 20 g of paper, leach the paper with about 200 ml of extraction fluid for 18 ± 2 h using shaker rotating/moving at 30 ± 2 rev/min. Filter the extract through glass fibre filter with 0.45 micron pore size.

A-4.4.3 Transfer the extract to a 250-ml conical flask. Add 5 ml concentrate nitric acid and a few boiling chips or glass beads. Slowly evaporate on a hot plate to about 10 to 20 ml. Continue heating and adding concentrated nitric acid until digestion is complete. Wash down with distilled water and then filter if necessary. Quantitatively transfer filtrate to a 100-ml volumetric flask, dilute to the mark and mix thoroughly.

A-4.4.4 Inject a measured portion of the digested solution into the graphite oven. Dry, char and atomize according to the preset programme. Measure the absorbance.

A-4.4.5 Prepare a reagent blank and sufficient standards containing 5.0, 7.5 and 10.0 mg/l of cadmium by diluting suitable volume of the standard cadmium solution with nitric acid (1:499). Inject a suitable portion of each standard solution in order of increasing concentration. Analyse each standard solution and measure the absorbances.

A-4.4.6 Calculation

Construct a standard calibration graph by plotting the absorbance versus mg of cadmium concentration of each standard. Read the concentration of the sample from the graph and determine the cadmium content of the sample from the calibration graph using the following formula:

$$\text{Cadmium (as Cd), ppm} = \frac{C \times F \times 100}{M}$$

where

C = concentration of cadmium from the calibration curve;

F = dilution factor; and

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M = mass of paper sample taken for testing, g.

A-5 DETERMINATION OF PENTACHLOROPHENOL (PCP)

A-5.1 Principle

PCP is extracted with acetone by Soxhlet extraction. Acetone extract is evaporated to dryness and subjected to acetylation. The acetylated PCP is determined quantitatively by Gas Chromatograph-Electron Capture Detector (GC-ECD).

A-5.2 Apparatus

A-5.2.1 Round Bottom Flask — 250 ml.

A-5.2.2 Soxhlet Extractor

A-5.2.3 Water Bath

A-5.2.4 Separating Funnels — 60 ml and 100 ml.

A-5.2.5 Injection Syringes — 1 μ l, 5 μ l and 10 μ l.

A-5.2.6 Gas Chromatograph with ECD — Capillary columns.

A-5.2.7 Glass Columns — Length 20 cm, internal diameter 12 mm filled with 5 cm of silica gel having particle size 63 μ m \times 200 μ m.

A-5.3 Reagents

A-5.3.1 Acetone

A-5.3.2 n-Hexane

A-5.3.3 Acetic Anhydride

A-5.3.4 Sodium Sulphate Anhydrous

A-5.3.5 PCP Stock Solution

Dissolve 10 mg of pentachlorophenol in 100 ml of acetone. One millilitre of this solution contains 0.1 mg of pentachlorophenol.

A-5.3.6 PCP Standard Solution

Dilute 10 ml of stock solution with acetone to 100 ml. One millilitre of this solution contains 0.01 mg of pentachlorophenol.

A-5.3.7 Internal Standard Stock Solution

Dissolve 1 g of 2, 4 dibromophenol in 1 l of acetone. One millilitre of this solution contains 1 mg of dibromophenol.

A-5.3.8 Internal Standard Solution

Dilute 1 ml of the stock solution (A-5.3.7) with acetone to 100 ml. One millilitre of this solution contains 10 µg of dibromophenol.

A-5.4 Procedure

A-5.4.1 Determine the moisture content of the sample as given in 9 of IS 1060 (Part 1) : 1966.

A-5.4.2 Weigh accurately about 1 g of the paper sample pieces up to two decimal places and put into a thimble. Extract with about 150 ml of acetone by Soxhlet extraction for 6 h. Filter the acetone extract, dry over anhydrous sodium sulphate, and evaporate under vacuum to a small volume approximately to 5 ml and cool.

A-5.4.3 Clean Up

Transfer the extract (A-5.4.2) to the silica gel packed column and elute with about 25 ml of *n*-hexane at the rate of 2 ml/min. Collect the eluent in a flask. Dry over anhydrous sodium sulphate and evaporate nearly to dryness.

A-5.4.4 Treat the residue (A-5.4.3) with 1 ml of acetic anhydride, and heat on a water bath for about 30 min. Remove the flask from the water bath and cool the acetylated product. Transfer the content in a separating funnel and add 10 ml of hexane and 5 ml distilled water. Shake well for 2 minutes and let the layers be separated. Collect the hexane layer, dry over anhydrous sodium sulphate and evaporate nearly to dryness. Cool for at least 10 minutes, add 1 ml of internal standard solution and adjust the volume to 5.0 ml with *n*-hexane.

A-5.4.5 Inject 2 µl of the solution into the Gas Chromatograph. Record the peak size in area and peak height units. If peak response exceeds linear range of the system, dilute the concentration of the extract and reanalyze.

A-5.4.6 Calibration

Prepare three calibration standards from the PCP standard solutions. Add 1 ml of internal standard solution and follow the steps as above (A-5.4.3 to A-5.4.5).

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Tabulate peak height or area responses against calculated equivalent mass of underivatized pentachlorophenol injected. Prepare a calibration curve.

A-5.5 Calculation

Determine the PCP content of the sample from the calibration graph using the following formula:

$$\text{PCP content, mg/kg on dry matter} = \frac{A \times B \times V_i \times 100}{M \times C \times V_t \times (100 - X)}$$

where

- A** = PCP content in μg from the graph;
- B** = total volume of hexane extract before derivetization, ml;
- V_i** = volume of eluent injected, ml;
- M** = mass of the paper sample taken for testing, g;
- C** = volume of hexane extract carried through derivatization, ml;
- V_t** = volume of total eluent, ml; and
- X** = moisture content, percent by mass.

A-6 DETERMINATION OF POLYCHLORINATED BIPHENYLS (PCBs)

A-6.1 Principle

PCB is extracted with boiling ethanolic potassium hydroxide solution. An aliquot of the extract is mixed with distilled water and subjected to extraction with hexane. The PCB content is determined quantitatively by GC-ECD by comparing the pattern of the peaks with the pattern of a suitable technical PCB.

A-6.2 Apparatus

A-6.2.1 Erlenmeyer Flask — 200 ml.

A-6.2.2 Water Bath

A-6.2.3 Separating Funnels — 60 ml and 100 ml.

A-6.2.4 Injection Syringes — 1 μl , 5 μl and 10 μl .

A-6.2.5 Gas Chromatograph with ECD — Capillary columns.

A-6.2.6 Glass Columns — Length 20 cm, internal diameter 12 mm filled with 5 cm of silica gel having particle size 63 μm \times 200 μm .

A-6.3 Reagents

A-6.3.1 *Ethanolic Potassium Hydroxide Solution*

Prepare 1 N ethanolic potassium hydroxide solution by dissolving the required amount of potassium hydroxide in absolute ethanol that has been purified as follows Dissolve 1.5 g of silver nitrate in 3 ml of water and add it to one litre of alcohol Dissolve 3 g of potassium hydroxide in the smallest amount of hot distilled water, cool, and add it to the silver nitrate solution Shake thoroughly, allow the solution to stand for at least 24 h, filter and distill

NOTE — Absolute alcohol denatured with 10 percent by volume of methanol may also be used

A-6.3.2 *n-Hexane*

A-6.3.3 *Sodium Sulphate Anhydrous*

A-6.3.4 *PCB Stock Solution*

Dissolve 10 mg of any PCB technical in 100 ml of hexane One millilitre of this solution contains 0.1 mg of PCB

A-6.3.5 *PCB Standard Solution*

Dilute 10 ml of stock solution with hexane to 100 ml One millilitre of this solution contains 0.01 mg of PCB

A-6.3.6 *Internal Standard Stock Solution*

Dissolve 1 g of 2,4-dibromophenol in 1 l of *n*-hexane One millilitre of this solution contains 1 mg of dibromophenol

A-6.3.7 *Internal Standard Solution*

Dilute 1 ml of the stock solution (A-6.3.6) with hexane to 100 ml One millilitre of this solution contains 10 µg of dibromophenol

A-6.4 Procedure

A-6.4.1 Determine the moisture content of the sample as given in 9 of IS 1060 (Part 1) 1966

A-6.4.2 Weigh accurately about 1 g of the paper sample pieces up to two decimal places and take into a 200 ml Erlenmeyer flask Add 50 ml of ethanolic potassium

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hydroxide solution and heat under reflux condenser for 4 h, filter and dilute to the mark with alcohol in a 250-ml volumetric flask. Take an aliquot portion of the test solution in a separating funnel, add sufficient distilled water and 15 ml hexane. Shake well for 5 minutes and wait for 15 minutes. Collect the hexane phase.

A-6.4.3 Filter the hexane extract. Dry the filtrate over anhydrous sodium sulphate, and evaporate under vacuum to approximately 5 ml. Take the residue for clean up.

A-6.4.4 Clean Up

Transfer the hexane extract (A-6.4.3) to the silica gel packed column and elute with about 25 ml of *n*-hexane at the rate of 2 ml/min. Collect the eluent in a flask and evaporate to a small volume. Add 1 ml of internal standard solution and made up to 10 ml with hexane.

A-6.4.5 Inject 2 μ l of the solution to the Gas chromatograph. From the peaks obtained PCB and Internal Standard are identified by their retention times as well as relative retention time.

A-6.4.6 Calibration

Prepare three calibration standards from the PCB standard solutions and follow the steps as above (A-6.4.3 to A-6.4.5). Tabulate peak height or area responses against calculated equivalent mass of underivatized pentachlorophenol injected. Prepare a calibration curve.

A-6.5 Calculation

Determine the PCB content of the sample from the calibration graph using the following formula:

$$\text{PCB content, mg/kg on dry matter} = \frac{A \times V_t \times 100}{M \times V_i \times (100 - X)}$$

where

A = PCB content in μ g from the graph;

V_i = volume of eluent injected, ml;

M = mass of the paper sample taken for testing, g;

V_t = volume of total eluent, ml; and

X = moisture content, percent by mass.

(CHD 16)

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**AMENDMENT NO. 2 JANUARY 2003
TO
IS 11357 : 1985 SPECIFICATION FOR COMPOSITE
CONTAINER FOR DRY PRODUCTS**

(*Page 6, clause 4.3.3*) — Substitute the following for the existing:

'4.3.3 Style 3 – Cap or Slip Cover End — Style 3 ends shall be made of plastics, or a combination of metal and plastic. The cap or cover shall be drawn and provided with a skirt having appropriate length that can be slipped over the open end of the container and fit shall be sufficiently tight so that the cap or cover does not fall off by its own mass when the empty can is held in the inverted position'.

(CHD 15)

Reprography Unit, BIS, New Delhi, India

Indian Standard

SPECIFICATION FOR COMPOSITE CONTAINER FOR DRY PRODUCTS

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(Continued on page 2)

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(Continued on page 9)

Indian Standard
**SPECIFICATION FOR
COMPOSITE CONTAINER FOR
DRY PRODUCTS**

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 29 March 1985, after the draft finalized by the Paper and Flexible Packaging Sectional Committee had been approved by the Marine, Cargo Movement and Packaging Division Council.

0.2 Composite containers with fibreboard body and metallic or plastic ends are commonly used for dry and powdered items, like detergents or cleansing powders, talcum powders, pharmaceuticals, food items and other like items. With the development of new lining materials, composite containers are finding their usage for a wide range of products. This standard lays down specification for the composite containers covering their various types and styles of construction, besides the materials. The choice of the lining material and the printing designs of the outside surface is left to the users of these packs.

0.3 In the preparation of this standard, considerable assistance has been derived from the USA Federal Specification No. PPP-C-55B-Cans, Composite for Dry Products.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2 - 1960*. The number of significant places retained in the round off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the requirements for composite containers with ends suitable for use as unit packages in the shipment and storage of dry products.

*Rules for rounding off numerical values (*revised*).

IS : 11357 - 1985

2. TERMINOLOGY

2.1 For the purpose of this standard the definitions given in IS : 1394 - 1984* and IS : 7186 - 1973† shall apply.

3. CLASSIFICATION

3.1 Types, Classes, Shape and Styles — The containers covered by this standard shall be designated by the following types, classes, shapes and styles :

- a) *Type I* — Spiral wound,
- b) *Type II* — Convolute wound,
- c) *Type III* — Lap seam,
- d) *Class 1* — Food product container,
- e) *Class 2* — Non-food product container,
- f) *Shape A* — Round,
- g) *Shape B* — Rectangular or oval,
- h) *Style 1* — Plain end,
- j) *Style 2* — Single or multiple friction plug end,
- k) *Style 3* — Cap or slip cover, and
- m) *Style 4* — Turn or sifter top.

3.2 Sizes — The size of a container shall be expressed by its nominal inside diameter \times nominal overall height in case of round containers, sectional length \times width \times height in case of rectangular containers and major diameter \times minor diameter \times height in case of oval containers.

3.2.1 The size of can shall be as specified by the purchaser.

4. REQUIREMENTS

4.1 Material — Material used for the construction of containers shall conform to the applicable requirements specified in this standard and shall be free from any defects which may impair serviceability or proper functioning under service conditions, or which may result in contamination which renders the product unfit for use. Material used in the construction of Class 1 containers shall comply with the requirements of the Food and Drugs authorities in the country.

4.1.1 Adhesives — Adhesives used shall not contaminate the packaged product and shall permit performance in accordance with the requirements of this standard. Polyvinyl acetate resin based synthetic

*Glossary of terms relating to metal containers trade (*third revision*).

†Glossary of terms relating to paper and flexible packaging.

adhesives, starch/dextrin or silicate adhesives may be used for bonding various plies as agreed to between the purchaser and the supplier.

4.1.2 Structural Plies — Structural plies shall be of kraft paper with a minimum burst factor of 20 or a combination of grey board and kraft paper of sufficient thickness as given in Table 1.

4.1.3 Ends — Ends shall be of paperboard, tinplate, black plate aluminium or plastics (thermoplastic or thermosetting, as desired by the purchaser).

4.1.4 Inner Barriers — Inner barriers, where necessary for product protection and containment, shall be combinations of paper and aluminium foil, combinations of paper and plastics or paper and regenerated cellulose film, or plastics or regenerated cellulose film alone or treated paper. Unless otherwise specified, the use of the type of inner barriers shall be at the option of the manufacturer.

4.1.5 Labels — Labels shall be combinations of paper and aluminium foil, combinations of paper and plastics film, or treated paper or cellulose film which shall withstand normal handling and provide container protection and product identification.

4.2 Construction

4.2.1 Body — The container body shall be either spirally or convolutely wound or of lap seam construction.

4.2.2 Spiral Containers — Body seams of spirally wound containers shall be overlapped, skived and overlapped, or butted. Where necessary, butt joint gaps shall be filled with a suitable flexible material.

4.2.3 Inner Barrier Overlap — Inner barrier edges shall be folded under, lapped, or otherwise sealed when necessary for product containment and protection.

4.2.4 Adhesive Bonds — All adhesive bonds shall be 80 percent minimum fiber tearing bonds when tested in accordance with 5.2.

4.2.5 Wall thickness — The body wall shall be of minimum body wall thickness as given in Table 1 when tested with the round anvil micrometer in accordance with the method given in 5.2.2.

4.3 Ends

4.3.1 Style 1 — Plain End — Style 1 ends shall be made of metal and shall be of minimum nominal thickness as given in Table 1.

TABLE 1 REQUIREMENTS FOR TYPE I, II AND III CONTAINERS

(Clauses 4.1.2, 4.2.5 and 4.3.1)

CROSS SECTIONAL AREA OF BODY	NOMINAL INSIDE DIAMETER	BODY WALL THICKNESS, Min	NOMINAL THICKNESS OF TINPLATE OR BLACKPLATE,	NOMINAL THICKNESS OF ALUMINIUM SHEET,
(1) cm ²	(2) mm	(3) mm	(4) mm	(5) mm
Up to 30	Up to 50	1.00	0.19	0.23
31 to 50	51 to 75	1.20	0.19	0.23
51 to 80	76 to 100	1.40	0.19	0.25
81 to 125	101 to 125	1.50	0.19	0.27
126 to 180	126 to 150	2.00	0.20	0.30
181 to 250	151 to 190	2.00	0.23	0.30

4.3.2 Style 2 — Single or Multiple Friction Plug End — Style 2 ends shall be made of metal or plastics. Closure shall be accomplished by single or multiple friction plug and shall be of proper tight fit.

4.3.3 Style 3 — Cap or Slip Cover End — Style 3 ends shall be made of plastics, or a combination of metal and plastics. The cap or cover shall be drawn and provided with a skirt having a minimum length of 12 mm that can be slipped over the open end of the can. Fit shall be sufficiently tight so that the cap or cover does not fall off by its own mass when the empty can is held in the inverted position.

4.3.4 Style 4 — Turn or Sifter Top End — Style 4 ends shall be made of metal, plastics, or a combination of metal and plastics. The turn or sifter top shall be a commercially available size with a number of opening at the option of the manufacturer.

4.4 Secondary Closure — When specified, the container shall be provided with a secondary closure made of paper board or plastic as specified in 4.1.3. The secondary closure shall not be bonded to the body walls in order to be used as the container closure after a non-reclosable end has been opened and removed. The secondary closure shall provide a sufficiently tight fit so that it will not fall off by its own mass when the empty container is held in the inverted position.

4.5 Workmanship — All finished containers shall be clean, free of foreign matter, and free from any defects which may affect the appearance or serviceability, such as surface scuffing, inadequate adhesion between plies, ragged joints, recutter cuts, imperfect seams or other defects.

5. SAMPLING AND TESTING

5.1 Sampling

5.1.1 Lot — A lot shall consist of all containers of the same types and sizes from one manufacturer, offered for delivery at one time.

5.1.2 Sampling — Samples shall be selected at random in accordance with IS : 2500 (Part 1) - 1973* and the cans shall be inspected for the following defects. The sample unit shall be one can. The inspection level shall be 1 with an acceptable quality level (AQL) of 2.5 expressed in terms of defects per hundred units for major defects and an AQL of 6.5 for minor defects.

<i>Examine</i>		<i>Category</i>	
		<i>Major</i>	<i>Minor</i>
Class	Not as specified	×	
Type	Not as specified	×	
Size	Not as specified	×	
Style	Not as specified	×	
Workmanship	Not in conformance with 4.5		×
Marking	Not as specified		×

5.2 Testing — Containers selected in accordance with 5.1.2 shall be tested for the following requirements : the sample unit shall be one container, and the inspection level which determines the sample size shall be 1. Test requirements apply to lot averages.

5.2.1 Adhesive Bonding — Using a sharp knife, cut the ends off the container body as close to the end seams as possible. Split the container body lengthwise so that it can be flattened out as a rectangle. Peel apart the liner overlap, liner, body plies, label and label overwrap. Measure any area where there is no fiber tearing adhesive bond and calculate the percentage of the total area involved to determine compliance with 4.2.4.

5.2.2 Body Wall Thickness — Body wall thickness shall be measured with a round head micrometer with a least count of 0.02 mm. Thickness shall be measured at four points diametrically opposite and the mean of the four readings shall be taken as the thickness of the wall.

*Sampling Inspection tables : Part 1 Inspection by attributes and count of defects (first revision).

6. PACKING AND MARKING

6.1 Packing — The containers shall be packed in corrugated fibreboard, solid-fibreboard or wooden boxes.

6.2 Marking — The containers may be marked with the name or trade-mark of the manufacturer, besides other markings as specified by the purchaser.

6.2.1 The containers may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors may be obtained from the Indian Standards Institution.

7. ORDERING DATA

7.1 Purchasers of the containers while ordering the containers to this specification shall furnish the following requirements in their purchase order:

- a) Title, number and date of this standard;
- b) Type, class, shape, style and size of containers,
- c) When a specific inner barrier is required,
- d) When a secondary closure is required, and
- e) Marking on containers, when required.

(Continued from page 2)

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 kg.m/s ²
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m ²
Frequency	hertz	Hz	1 Hz = 1 c/s (s ⁻¹)
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m ²



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